WHAT IS CLAIMED IS:

1. A production method of polyamide by batch melt polymerization, which comprises a step of developing at least one estimating equation selected from the group consisting of an estimating equation for calculating a mole balance (diamine unit/carboxylic acid unit) of polyamide under melt polymerization from a melt viscosity of polyamide measured at a set point during the melt polymerization, an estimating equation for calculating a molecular weight of polyamide under melt polymerization from the melt viscosity, and an estimating equation for calculating a relative viscosity of polyamide under melt polymerization from the melt viscosity; and a step of estimating using said at least one estimating equation at least one property selected from the group consisting of a mole balance, a molecular weight and a relative viscosity of polyamide under melt polymerization from a melt viscosity of polyamide measured at a set point during melt polymerization in next and subsequent batches.

2. The production method according to Claim 1, wherein polymerization conditions (time, pressure, temperature) until the polyamide is discharged from a polymerization vessel are determined on the basis of the estimated mole balance.

3. The production method according to Claim 1, wherein the estimating equation for calculating the mole balance is a linear equation represented by the following Equation A:

$$\text{Mole balance} = a \times MV + b \qquad (A)$$

wherein MV is melt viscosity (Pa·s), and a and b are empirical constants.

4. The production method according to Claim 1, wherein polymerization conditions (time, pressure, temperature) until the polyamide is discharged from a polymerization vessel are determined on the basis of the estimated molecular weight.

5. The production method according to Claim 1, wherein polymerization

conditions (time, pressure, temperature) until the polyamide is discharged from a polymerization vessel are determined on the basis of the estimated relative viscosity.

6. The production method according to Claim 1, wherein the melt viscosity of polyamide is calculated from a measured stirring torque using an estimating equation which is developed from a relationship between the melt viscosity and the stirring torque generated by a rotation of stirring blade for stirring and mixing the polyamide.

7. The production method according to Claim 6, wherein a pressure of a batch polymerization vessel at the measurement of the stirring torque is in a variation range within ±10 kPa of an average pressure between batches conducted for developing the estimating equation.

8. The production method according to Claim 1, wherein the set point during melt polymerization is determined by a temperature of polyamide in a batch polymerization vessel.

9. The production method according to Claim 1, wherein the set point during melt polymerization is determined by a time taken from initiation of amidation reaction.

10. The production method according to Claim 1, wherein a total amount of a polyamide of a previous batch remaining in a batch polymerization vessel and starting materials for polyamide charged at the beginning of melt polymerization is in a variation range within ±1/50 of an average total amount between batches conducted for developing the estimating equation.

11. The production method according to Claim 1, wherein the melt polymerization for producing polyamide in a batch polymerization vessel is conducted by directly adding a diamine component to a molten dicarboxylic acid component in the absence of solvent.

12. The production method according to Claim 11, wherein the mole balance of polyamide under melt polymerization is estimated from the melt

viscosity at the set point during melt polymerization, and an addition amount of the diamine component is controlled on the basis of the estimated mole balance.

13. The production method according to Claim 11, wherein the diamine component comprises 70 mol% or more of xylylene diamine.

14. The production method according to Claim 11, wherein the diamine component comprises 70 mol% or more of bis(aminomethyl)cyclohexane.

15. The production method according to Claim 11, wherein the dicarboxylic acid component comprises 50 mol% or more of adipic acid.

16. A production method of polyamide by solid phase polymerization of batch melt-polymerized polyamide, which comprises:

(1) developing an estimating equation for calculating a mole balance (diamine unit/carboxylic acid unit) of polyamide under melt polymerization from a melt viscosity of polyamide measured at a set point during the melt polymerization, and calculating a mole balance of polyamide at the set point during the melt polymerization of next and subsequent batches from the estimating equation;

(2) developing an estimating equation for calculating a molecular weight or relative viscosity of polyamide from the melt viscosity, and calculating a molecular weight or relative viscosity at an end point of the melt polymerization of next and subsequent batches from the estimating equation; and

(3) determining conditions (temperature, time and pressure) of the solid phase polymerization of the melt-polymerized polyamide on the basis of the calculated values in the steps (1) and (2).

17. The production method according to Claim 16, wherein the estimating equation for calculating the mole balance is represented by the following Equation A for a mole balance range of 0.997 or less, and1.003 or more:

Mole balance = a × MV + b (A)

wherein MV is melt viscosity (Pa·s), and a and b are empirical constants.

18. The production method according to Claim 16, wherein the set point during melt polymerization is determined by a temperature of polyamide in a batch polymerization vessel.

19. The production method according to Claim 16, wherein the set point during melt polymerization is determined by a time taken from initiation of amidation reaction.

20. The production method according to Claim 16, wherein the estimating equation for calculating the molecular weight of polyamide from the melt viscosity at the end point of melt polymerization is represented by the following Equation B:

$$c \times \log (MW) = \log (MV) + d/T + e \quad (B)$$

wherein MW is molecular weight, MV is melt viscosity (Pa·s), T is temperature (°C), and c, d and e are empirical constants.

21. The production method according to Claim 16, wherein the estimating equation for calculating the relative viscosity of polyamide from the melt viscosity at the end point of melt polymerization is represented by the following Equation C:

$$f \times \log (RV) = \log (MV) + g/T + h \quad (C)$$

wherein RV is relative viscosity, MV is melt viscosity (Pa·s), T is temperature (°C), and f, g and h are empirical constants.

22. The production method according to Claim 16, wherein the melt viscosity at the set point during melt polymerization and the melt viscosity at the end point of melt polymerization are calculated from a relationship between the melt viscosity and a stirring torque generated by a rotation of stirring blade for stirring and mixing polyamide.

23. The production method according to Claim 22, wherein a total amount of a polyamide of a previous batch remaining in a batch polymerization

vessel and starting materials for polyamide charged at the beginning of melt polymerization is in a variation range within ±1/50 of an average total amount between batches conducted for establishing the relationship.

24. The production method according to Claim 22, wherein a pressure of a batch polymerization vessel at the measurement of the stirring torque is in a variation range within ±10 kPa of an average pressure between batches conducted for establishing the relationship.

25. The production method according to Claim 16, wherein the melt polymerization for producing polyamide in a batch polymerization vessel is conducted by directly adding a diamine component to a molten dicarboxylic acid component in the absence of solvent.

26. The production method according to Claim 25, wherein the diamine component comprises 70 mol% or more of xylylene diamine.

27. The production method according to Claim 25, wherein the diamine component comprises 70 mol% or more of bis(aminomethyl)cyclohexane.

28. The production method according to Claim 25, wherein the dicarboxylic acid component comprises 50 mol% or more of adipic acid.